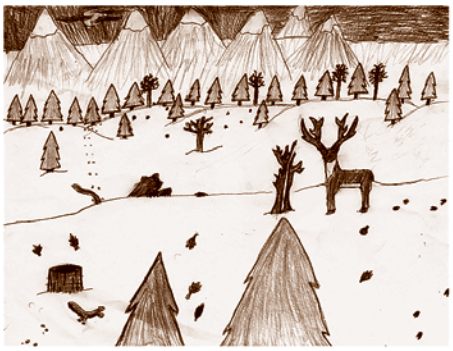


KELLEN DAY

FIELD TRIP

Living & Non-living Interactions

Theme
All things, living and non-living are constantly interacting with one another.

Utah State Science Core Curriculum Topic
Standard Two: Students will understand that organisms depend on living and nonliving things within their environment.
Objective One: Classify living and nonliving things in an environment.
Objective Two: Describe the interactions between living and nonliving things in a small environment.

Field Trip Location
Any area with some cryptobiotic soil, a variety of plants, and evidence of animals. A dry wash is usually diverse enough, and is an easy place to manage students without negatively impacting cryptobiotic soil or plants. Any season.

Times
Post trip lesson is 45 minutes. All the other lessons are 30 minutes.

Science Language Students Should Use:
environment, interaction, living, non-living, organism, survive, observe, terrarium, aquarium, temperature, moisture, small–scale

Background

An ecosystem can be defined as all the living and non-living things in a given area and their interactions. The non-living things include climate (weather, temperature, rainfall), geology (rocks, soil type), and geography (location of vegetation communities, exposure to elements, location of food and water sources relative to shelter sites). Soil is often comprised of both living and non-living elements. Living elements can continue to affect the community even after they change to non-living substances. An ecosystem is commonly a large area and can include many square miles of land or water. It includes many interconnected habitats. The two most important things to emphasize about an ecosystem are that all the members (living and non-living) are connected and that changes in one habitat or organism cause changes in another. Some relationships between members are direct and obvious. Other relationships are not so obvious.

A natural community is composed of plants and animals living and interacting within an area that has similar physical characteristics throughout. A community is usually defined by and commonly named for its predominant vegetation. Communities in southeastern Utah include canyon-riparian, slickrock, piñon-juniper, sagebrush, blackbrush, and montane.

Within a desert ecosystem, there are many communities, which all respond to these basic conditions: not much water (aridity), hot summer days, cold winter nights, and wind.

A food chain represents the transfer of energy from the sun to living organisms. Producers are green plants that use the sun's energy directly. Primary consumers (herbivores) feed directly on the producers. Secondary consumers (carnivores) feed on the primary consumers or other secondary consumers. Omnivores can be primary or secondary consumers.

Decomposers, such as bacteria, fungi, termites, and earthworms, are scavengers that feed on the organic material found in dead producers and consumers. They break down the organic material to the nutrient level. Nutrients in soils are essential for producers to grow. Nutrients include nitrogen, carbon, and phosphorous. Thus, dead consumers (and producers) are recycled back into new producers.

In every ecosystem, various food chains are interconnected in a food web. Food chains and food webs indicate the eating patterns of the members of an ecosystem. Each component of the food web is necessary for the health of the ecosystem as a whole.

Any food web or food chain is a system that transfers energy from the sun. Each link in the chain depends on the link below it. Producers incorporate the sun's energy and, in turn, are eaten by herbivores. Herbivores are eaten by carnivores or omnivores. Ninety percent of the energy is lost in each transfer, explaining why there are so many more producers than herbivores and so many more herbivores than carnivores. A food pyramid, with producers at the bottom, primary consumers in the middle, and secondary consumers at the top, illustrates this concept.

PRE-TRIP ACTIVITY

All the Pieces

Objectives

Students will be able to:

a. Describe the difference between living and non-living objects.

b. Define *producer, consumer, herbivore* and *carnivore*.

Materials

Diorama, plastic tote painted to look like an empty landscape; pieces of the ecosystem; *The Most Unusual Lunch* (Bender, 1994)

PROCEDURE

1) Ask students if they can think of examples of *food chains*, and write a few examples on the board. Ask students to look at the first organism in every food chain. Point out that they are all plants. Explain that plants are also called *producers* because they produce their own food (using sunlight, water, etc.). Tell students that all the other organisms, which eat plants or other animals, are called *consumers*. Explain that the consumers can be divided up based on what they eat (*herbivores*, *carnivores* and *omnivores)*. Add a *decomposer* or *scavenger* organism to the end of one or two of the food chains on the board, and describe them as eaters of dead stuff. Explain that they turn the food chain into a cycle, recycling nutrients back into the soil to help the producers grow.

2) Read the students the book *The Most Unusual Lunch*. Discuss the food chain that occurs in the story.

3) Ask the students if everything in an environment is alive. Have students name some things that are alive in the desert. Tell students that living things grow, change and reproduce. Some move about on their own. Ask the students if they can name some things that are not alive that might be important in an environment. Discuss how climate, geography, and soil affect the living organisms in an environment. Ask students if they know what organic matter is. Explain that it is stuff that is or was once alive. Ask them how dead organic matter might affect the ecosystem.

4) Tell the students that an ecosystem is an environment where all the living and non-living things interact with and are dependent on one another. Tell them they are going to get a chance to make an ecosystem. Bring out the empty diorama. Have the students pick a partner. Have each student pick an object from the diorama collection and discuss with his or her partner what it is, how to classify it, and how it relates to the ecosystem. Some examples might include bighorn sheep are eaten by the mountain lion. The rock creates a home for the packrat. One at a time, have the students come and present their object to the class, tell how it interacts and place it in the diorama.

5) Discuss with the students what might happen if some or all of the objects in the diorama were changed.

6) Review what they will need to bring on their field trip.

STATION #1

Everything is Connected

(adapted from Van Matre and others, 1987)

Objectives

The students will be able to:

a. Describe a simple food chain.
b. Name at least one producer, one herbivore, and one carnivore.
c. Name one non–living thing and discuss how it affects its ecosystem.

Materials

yellow ball; string; photographs of producers, herbivores, omnivores, and carnivores (two or three of each); pencils; clipboards; paper.

PROCEDURE

1) Inform students that they are going to make a "munch line" or food chain. Place the yellow ball, which represents the sun, in a tree, or have a parent hold it. The string from the ball represents the sun's energy that hits the earth. Pass out one postcard or photo to each student. Ask those who think that they are producers, who get energy directly from the sun, to stand up. Briefly discuss each of their photos, and have the group confirm that each organism is a producer. As each is confirmed, have them line up next to the sun, hold onto the string (energy) from the sun, and hold up their photos. Repeat the exercise with the herbivores, omnivores and carnivores, and discuss the differences. Have students make a c-shaped line for best group viewing.

2) Ask the students if they can think of something non-living that moves up the food chain, such as energy and nutrients. Discuss how energy is passed up the line and how some energy is lost at each level. Discuss how nutrients move through the food chain and are finally returned to the soil. Collect the postcards and photos. Have students think of some other non-living things that effect how plants and animals grow (e.g. location of water, soil vs. rock).

3) Divide students into pairs. Give each pair of students a clipboard, pencil, and paper. The paper should be divided into three sections with lines for writing in the bottom half of the sections. Ask the students to pick three things within set boundaries and to draw one in each of the sections. One thing should be smaller than a penny, one larger than a dog, and one in between (leaf, rock, tree, feather, or track). On the writing lines have the students answer the following questions about each object.

What is it?

Is it living or non-living?

If living, where does it fall in food chain?
(e.g. herbivore, carnivore).

4) Tell the students that non-living things can change an environment. As an example, ask the students to think of something that might affect everything in the desert ecosystem. Help them figure out that they are in a wash and that heavy rain sometimes fills up the wash and move things around.

5) Have the students pick one of the objects on their paper. Ask them to predict how their object would react to a flash flood. They should turn the paper over and record their predictions in either words or pictures. Remind them to think of the food chain they created earlier. Ask students to predict how the effects of the flood could be carried up the food chain. Have students present their object, questions, and predictions. Discuss how they could confirm their predictions.

STATION #2

All Things Dead or Alive

Objectives

Students will be able to:
a. Describe the nutrient cycle.
b. List three decomposer organisms.

Materials

nutrient cycle poster; pictures of decomposers; box of nutrient-rich soil with different types of decomposers; hand lenses; leaf picture.

PROCEDURE

1) Have students name some characteristics of both living and non-living things. Tell the students that soil contains nutrients (minerals) that all living things need in order to grow. Some of these nutrients are nitrogen, carbon, calcium, and phosphorous. Ask the students if they have ever helped their parents fertilize a garden or house plants. Explain that when you are fertilizing plants, you are adding these nutrients. In nature, these nutrients are returned to the soil by decomposers. This is called the nutrient cycle. Discuss the nutrient cycle poster and the interaction of the nutrient cycle with an entire ecosystem.

2) Tell students that for the next game, they are going to imitate a variety of decomposers. Show and have students practice the various poses or movements. Play Cycle Says in the manner of Simon Says. The goal of this game is to reinforce the diversity of decomposers and to review their role in cycling nutrients. Some suggestions are:

- Caw like a raven.
- Crawl like a beetle.
- Arms up in a "V" like a turkey vulture.
- Be small like bacteria.
- Wiggle like an earthworm.
- Chew like a termite.
- Wave antennae like an ant.
- Stand up like a mushroom.
- Inch along like a larva.
- Spin silk like a spider.
- Move like a millipede.

3) Show pictures of decomposer organisms. Bring out the box of soil with decomposers in it. Use hand lenses to explore the different kinds of decomposers present in the soil. Point out that some of the non-living things in the box were once alive. Explain that it is this dead organic matter that the decomposers eat. In soil, it is recycled back to the nutrient level so that plants may use it. Observe the nutrient-rich soil, and compare it to a handful of sand from the wash. Ask the students which soil type has more nutrients in it? In which soil type will plants grow better?

4) Play the Circle Cycle Game in the manner of Duck, Duck, Goose. Have one student decide what decomposer, or nutrient "cycler," he wants to be. Have that student take the "nutrients" (the leaf) and walk around the outside of the circle. The cycler drops the nutrients in front of a seated player and runs around the circle. The seated player picks up the leaf and tries to tag the cycler. The cycler tries to get back to the spot where that player was seated without getting tagged. If the cycler is tagged, then she remains the cycler and tries again. If the cycler succeeds in sitting in the abandoned spot before getting tagged, the other player becomes the new cycler.

Studying decomposers

STATION #3

Who's for Lunch?

Objectives

The students will be able to:

a. Discuss the interplay of population and food supply in a predator-prey relationship.
b. List at least two causes of changes in the balance of nature.

Materials

predator and/or prey puppet; copy of story "*Glusabi and the Game Animals*" (Caduto and Bruchac 1988, 164-169); blindfolds (for extension/variation activity).

PROCEDURE

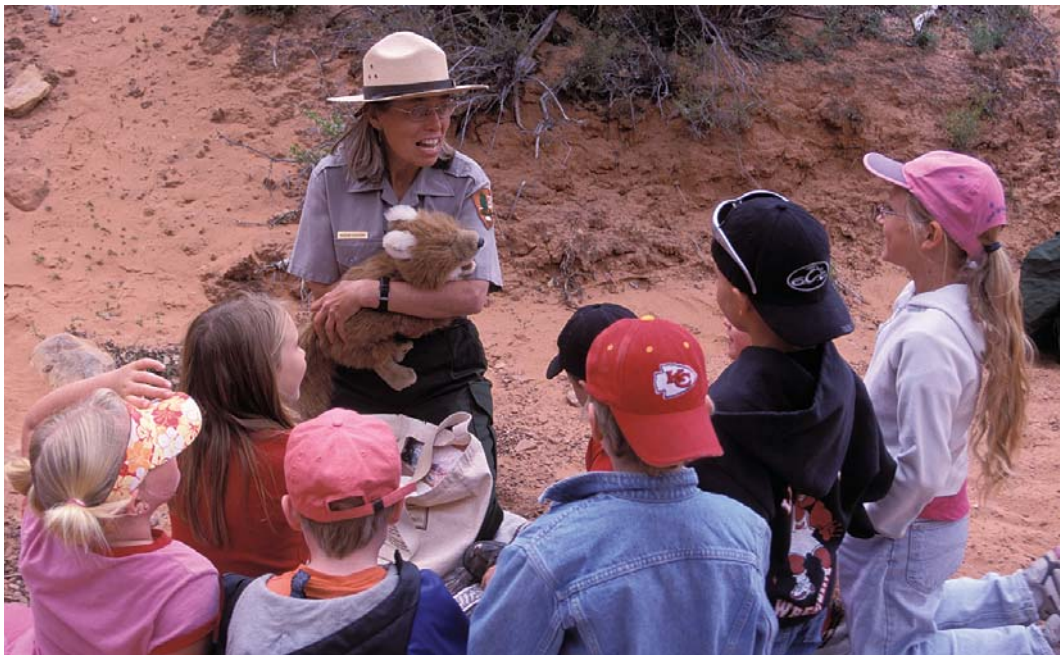
1) Use a puppet (e.g. fox) to discuss the concept of predators and prey. Have the students' name some things that the fox might want to eat. Have the students tell you if the animals they name are herbivores, omnivores, or carnivores. Discuss that these animals are prey for the fox and the fox is the predator. Ask the students if an animal can be both predator and prey. Have the students name some animals that might eat the fox. Discuss that these animals are carnivores or omnivores. Introduce the idea of population fluctuations by having the puppet lament over what will happen to him and his friends if there aren't enough mice available. Discuss some living and non-living things that might cause living populations to fluctuate.

2) Read "*Gluscabi and the Game Animals*." Discuss the story and its lessons. Ask why Grandmother Woodchuck told Gluscabi to put the animals back where they belong. Ask students what they think Grandmother meant by, "Things must be in the right balance." Discuss the fluctuation of populations and what happens when there are too many or too few predators. Discuss how a balance in nature is critical to a healthy ecosystem.

3) Instruct students in how to play the Predator-Prey Race. Draw three parallel lines, about fifteen feet apart, across a sandy, open area. Have the group stand facing each other near the center line (close enough so that students can touch outstretched fingers). The other two lines indicate safe zones. Assign a predator name to one team and its prey to the other. Instruct students to think quickly, run to their safe zone if they are prey, or run after and try to tag the prey if they are predators. Any tagged prey must join the predator team, and a new round begins. Start off with obvious predator-prey pairs, and then proceed to trickier ones. Discuss any pairs that produce confusion, before the next round. Relate fluctuations in numbers of students on each team to the previous discussion of population fluctuations. Point out instances when the ecosystem is out of balance. Examples include: *dragonflies/mosquitoes, grasshoppers/plants, spiders/insects, foxes/mice, mountain lion/ mule deer, bald eagle/fish, bobcat/rabbit, desert bighorn sheep/indian ricegrass, rabbit/rabbitbrush, mosquitoes/humans*.

Note: Navajo students could have cultural difficulties if coyotes, bears, or reptiles are discussed in food chain situations. Try to avoid using these animals in the predator-prey game.

Discussing the concept of predators and prey with a fox puppet



POST-TRIP ACTIVITY

The Mask of Life

Objectives

Students will be able to:

a. Define the terms *producer*, *herbivore, carnivore,* and *omnivore*.

b. Describe the proportions of a balanced ecosystem.

Materials

poster of animals; bucket; category cards (11 cards labeled producer, 6 herbivore, 3 omnivore, 1 carnivore, and 4 decomposer); blank masks; craft sticks; construction paper; glue; markers; scissors.

PROCEDURE

1) In the classroom, review the definitions of *ecosystem*, *producer, herbivore*, *carnivore*, *omnivore, decomposers, living things, and non-living things*.

2) Tell the students that they are going to become living things in an imaginary ecosystem. Discuss how everything interacts. Ask the students to name some creatures they might find in the desert ecosystem. Write answers on the board in the appropriate category (herbivore, carnivore, etc.) Ask the students to predict how many things out of each category they would expect to find in an ecosystem of twenty-five living things. Write the answers on the board. Tell the students that the ecosystem they are going to make is similar in proportion to a real ecosystem and that there will be similar numbers of creatures. Explain that they will each pick a card out of a bucket that has a category written on it. Once they get their card, they get to choose an animal in that category to become (they can either look at the list on the board or the animal poster for their choices). Show the students the animal poster. Walk around, letting each student pick a card from the bucket. As you collect the cards, make sure all the children have picked an animal. Tell the students that they get to become their animals by making masks.

3) Show them examples of masks made for some of the animal choices. Distribute blank masks, craft sticks, construction paper, markers, scissors, etc. Give students about 15 minutes to make their masks.

4) Tell the students that it is time to see how many different things are in our imaginary ecosystem. Ask the students who are producers to hold their mask and stand up at their desks. As a class, count how many there are, and record the information on the board. Discuss how their predication differed from the actual number of producers in the ecosystem. Repeat with the other categories of animals. Ask the students how they could conduct a similar experiment in the natural world.

EXTENSION

Have students place their masks on a large wall mural depicting the desert food web.

References and Resources

Bender, R. (1994) *The most unusual lunch*. _____:Dail Books.

Brady, I. (1998). *The redrock canyon explorer*. Talent, OR: Nature Works.

Caduto, M. & Bruchac, J. (1988). *Keepers of the earth: Native American stories and environmental activities for children*. Golden, CO: Fulcrum.

Cornell, J. (1979). *Sharing nature with children*. Nevada City, CA: Ananda Publications.

Daugs, D. R. (1992). *Foundations in science for elementary teachers*. Logan, UT: Utah State University.

Storer Camps. (1988). *Nature's classroom: A program guide for camps and schools*. Martinsville, IN: American Camping Association.

Tweit, S. J. (1992). *The great southwest nature factbook*. Bothell, WA: Alaska Northwest Books.

Van Matre, S., Johnson, B., Soloway, E., & Bires, F. (1987). *Conceptual encounters I*. Warrenville, IL: The Institute for Earth Education.

Williams, D. (2000). *A naturalist's guide to canyon country*. Helena, MT: Falcon Publishing.